

**Claim List – Status and Support of Current Amendment Changes**

Claim	Status	Type	Support of Changes
1	Pending	Method	Added "separate from the polymeric quaternary ammonium compound" - ref. abstract, and col. 7 line 63 – col. 8 line 22.
2	Pending	Method	There are no changes in this amendment.
3	Pending	Method	There are no changes in this amendment.
4	Pending	Method	There are no changes in this amendment.
5	Pending	Method	There are no changes in this amendment.
6	Pending	Method	There are no changes in this amendment.
7	Pending	Method	There are no changes in this amendment.
8	Pending	Method	There are no changes in this amendment.
9	Cancelled	N/A	N/A
10	Pending	Method	There are no changes in this amendment.
11	Original	Method	There are no changes in this amendment.
12	Pending	Method	There are no changes in this amendment.
13	Pending	Method	There are no changes in this amendment.
14	Pending	Method	There are no changes in this amendment.
15	Pending	Method	There are no changes in this amendment.
16	Pending	Method	There are no changes in this amendment.
17-21	Cancelled	N/A	N/A
22	Pending	Method	There are no changes in this amendment.
23	Cancelled	N/A	N/A
24	Pending	Method	There are no changes in this amendment.
25	Pending	Method	There are no changes in this amendment.
26	Pending	Method	There are no changes in this amendment.
27	Pending	Method	There are no changes in this amendment.
28	Pending	Method	There are no changes in this amendment.
29-32	Canceled	N/A	N/A
33	Pending	Method	There are no changes in this amendment.
34	Cancelled	N/A	N/A
35	Pending	Method	There are no changes in this amendment.
36	Pending	Method	There are no changes in this amendment.
37	Pending	Method	There are no changes in this amendment.
38	Pending	Method	There are no changes in this amendment.
39	Cancelled	N/A	N/A
40	Pending	Method	There are no changes in this amendment.
41	Pending	Composition	There are no changes in this amendment.
42-43	Cancelled	N/A	N/A
44	Pending	Composition	There are no changes in this amendment.
45	Pending	Composition	There are no changes in this amendment.
46	Pending	Composition	There are no changes in this amendment.

47	Pending	Composition	Changed to "comprises a cationic moiety having" – grammatical error correction.
48	Pending	Composition	There are no changes in this amendment.
49-50	Cancelled	N/A	N/A
51	Pending	Composition	There are no changes in this amendment.
52	Pending	Composition	There are no changes in this amendment.
53	Pending	Composition	There are no changes in this amendment.
54	Pending	Composition	Changed to "comprises an anionic moiety having" – grammatical error correction.
55	Pending	Composition	There are no changes in this amendment.
56	Cancelled	N/A	N/A
57	Cancelled	N/A	N/A
58	Pending	Composition	There are no changes in this amendment.
59-66	Cancelled	N/A	N/A
67	Pending	Composition	There are no changes in this amendment.
68	Pending	Composition	There are no changes in this amendment.
69	Pending	Composition	There are no changes in this amendment.
70	Pending	Composition	There are no changes in this amendment.
71 - 72	Canceled	N/A	N/A
73	Pending	Method	There are no changes in this amendment.
74 - 79	Canceled	Method	N/A

**Applicant's Responses to the Examiner's Rejections, Arguments and Objections****Rejections under 35 U.S.C. Sec. 112, 2<sup>nd</sup> Paragraph****Examiner –**

Claims 1– 8,10-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Per claim 1, it is unclear what "adding a cationic or ***separately*** adding" an anionic polyacrylamide to the sludge means. Adding a cationic polyacrylamide to the sludge is clear on its face. Adding an anionic polyacrylamide to the sludge is clear on its face. It is not clear what "separately adding" means. Adding an anionic polyacrylamide separate from ***what?*** Separate from a cationic polyacrylamide ? If so, this interpretation is too confusing to pass muster under Sec 112, second paragraph, for it is not at all clear that a cationic polyacrylamide must be added if an anionic polyacrylamide is being added. If not this interpretation, then it is unclear what other material must also be added and added separate and apart from the anionic polyacrylamide. Each claim that is dependent on claim 1, i.e., claims 2 – 8,10-16, is also rejected for this reason as no such dependent claim resolves this fatal ambiguity.

**Applicant/Owner Response**

Applicant/Owner appreciates the Examiner's work in defining this rejection. To correct, applicant has reworded independent claim 1 to state:

1. A method for dewatering biological sludge from a thermophilic digestion process, comprising:
  - a. adding a polymeric quaternary ammonium compound, as primary component, to the biological sludge; and

b. adding to the biological sludge a cationic polyacrylamide or separate from the polymeric quaternary ammonium compound adding an anionic polyacrylamide;

such that the polymeric quaternary ammonium compound and the polyacrylamide enhance dewatering of the sludge.

Applicant/Owner has respectfully traversed the Examiner's rejection of independent claim 1, as well as those claims depending upon independent claim 1; therefore, Applicant/Owner respectfully requests an allowance of claim 1, along with those claims dependent upon independent claim 1 as amended herein.

#### **Examiner –**

Claims 47 and 54 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 47 states that the polymeric quaternary ammonium compound "comprises" a specified molecular weight. This construction is confusing. By analogy, it would be confusing to state that a person "comprises" 200 lb. or 98.6°F. This rejection may be overcome by amending the claim in question to specify that the polymeric quaternary ammonium compound "has" a molecular weight in a specified range; "wherein said polyacrylamide comprises ~~comprising~~ a cationic moiety ~~comprises~~ having" a molecular weight in a specified range; and "wherein said polyacrylamide comprises ~~comprising~~ an anionic moiety ~~comprises~~ having" a molecular weight in another specified range. The same grounds for rejection and suggested amendments apply to claim 54.

#### **Applicant/Owner Response**

Applicant appreciates the Examiner's work in defining this rejection. To correct, applicant has reworded dependent claim 47 to state:

47. The sludge composition of claim 41, wherein said polymeric quaternary ammonium compound comprises a molecular weight in the range of about 500,000 to about 3,000,000; wherein said polyacrylamide comprises a cationic moiety having a molecular weight in the range of about 5,000,000 to about 16,000,000; or wherein said polyacrylamide comprises an anionic moiety having a molecular weight in the range of about 5,000,000 to about 15,000,000.

And, Applicant/Owner has amended dependent claim 54 to state:

54. The sludge composition of claim 48, wherein said polymeric quaternary ammonium compound comprises a molecular weight in the range of about 500,000 to about 3,000,000, wherein said polyacrylamide comprises a cationic moiety having a molecular weight in the range of about 5,000,000 to about 16,000,000; or wherein said polyacrylamide comprises an anionic moiety having a molecular weight in the range of about 5,000,000 to about 15,000,000.

Applicant/Owner has respectfully traversed the Examiner's rejections of claims 47 and 54; therefore, Applicant/Owner respectfully requests an allowance of claims 47 and 54 as amended herein.

**Examiner –**

Claims 33, 35 - 37 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted step is: Contacting the sludge with a polyacrylamide. Claim 33 is directed to a method for dewatering sludge. The claimed method recites only the step of adding to the sludge a polymeric quaternary ammonium compound even though the specification states that each "polyquaternary amine [sic] chemical component used in the chemical method is not large enough to create large enough flocs to dewater the sludge." See also col 5 lines 53-57.

Accordingly, any claim that does not recite the addition of both a polymeric quaternary ammonium compound and a polyacrylamide fails to recite an essential step of the process for dewatering sludge. Claims 34 - 37 are rejected for the same reasons as claim 33 given that none of claims 34 - 37 recites the step of "further comprising adding polyacrylamide to the sludge," or the like. Note that claims 38, 73 are not rejected on the foregoing basis.

Applicant admits at page 28 of the 1/9/08 response that his "Methods One and Two . . . teach the *need* of a polyacrylamide, cationic and anionic, respectively, along with the primary component" (emphasis added).<sup>1</sup> Accordingly, the rejection is maintained because the claims of this application are properly directed only to the inventions of Method One and Method Two.

#### **Applicant/Owner Response**

Applicant/Owner refers the Examiner to col. 3 lines 60 – 63 of the instant specification, wherein is stated:

"An additional object of the invention is to devise a method for dewatering of biological sludge that has been digested by a thermophilic digestion process with **polyquaternary amine** being used as the primary component." (**Emphasis added**)

Applicant/Owner also refers the Examiner to col. 5 lines 1 to 4 of the instant specification, wherein is stated:

"The significant improvements of this invention in sludge dewatering are accomplished by the addition of **polyquaternary amines** to the sludge." (**Emphasis added**)

Applicant/Owner presents to the Examiner that the quotation "the polyquaternary amine does not contain enough molecular weight for dewatering of the sludge" is taught from within Method One and is therefore a teaching directly related to Method One. This is while the above quotations in columns 3 and 4 are taken outside of and prior to the specific teachings of Method One in the instant specification. Applicant/Owner respectfully presents to the Examiner that Method One

teaches a method of dewatering when the polyquaternary ammonium compound does NOT provide enough molecular weight. As this is the teaching within Method One and is taught within the paragraph for Method One, such does apply to Method One. However, Method One is not the only use of a polyquaternary ammonium compound within the instant specification. As the teachings within columns 3 and 4 are taught in the instant specification outside of and previous to Method One teachings, Applicant/Owner again respectfully refers the Examiner to MPEP 1412.01 and the case law referenced therein, e.g. *In re Doyle*, as discussed further by Applicant/Owner previous in this proceeding.

Further, Applicant respectfully presents to the Examiner that while Methods 3 and 4 have been restricted from this proceeding, such a restriction DOES NOT limit this proceeding to only methods one and two. Applicant again respectfully refers the Examiner to MPEP 1412.01 and the case law referenced therein, e.g. *In re Doyle*, as discussed further by Applicant/Owner previous in this proceeding.

Applicant/Owner has respectfully traversed the Examiner's rejection of independent claim 33, as well as dependent claims 34-37 which depend upon independent claim 33; therefore, Applicant/Owner respectfully requests an allowance of claims 33 and 34-37 as amended herein.

### **35 U.S.C. 103(a) Rejections**

#### **The Examiner -**

Eberhard (in view of Williams) and McGrow (in view of Reimschuessel and USP 5178774 to Payne) for Claims 1 – 2, 4 – 8, 10 – 13, 15 – 16, 19, 22, 24 – 28, 33 – 38, 40 – 41, 44 – 48, 51 – 55, 58, 67 – 71, and 73.

#### **Eberhard**

USP 5019267 to Eberhard at Example 3 (col 5) describes a method for dewatering biological sludge from a "constant 50°C" (col 5 line 58) digestion process. Eberhard describes adding a cationic polymeric flocculent, i.e., Zetag 92, to the biological sludge. As evidenced by USP 5561520 to Williams, Zetag 92 compound is an ultra-high molecular weight polyacrylamide carrying a medium charge density (col 6 line 10).

Example 3 of Eberhard does not describe a sludge from a "thermophilic digestion process," as that term is defined by applicant / owner in his original specification, because 50°C is not "greater than about 55°C" (Haase '435, col. 2 lines 12-14).<sup>2</sup> Eberhard does not describe adding a polymeric quaternary ammonium compound as primary component to the biological sludge. Eberhard does not describe the combination of a polymeric quaternary ammonium compound and a polyacrylamide as enhancing the dewatering of thermophilic sludges.

#### McGrow

USP 5213693 to McGrow is directed to a sewage-derived (col 1 line 19) sludge dewatering processes. McGrow teaches that when the McGrow application was filed in 1990, it was "standard practice" to facilitate the dewatering of an aqueous suspension by adding coagulant and/or flocculent to it (col 1 lines 5 – 6). McGrow defines a "coagulant" as a highly ionic low molecular weight material that achieves its effect primarily by absorbing onto the surface of the suspended particles and changing the surface charge on them (col 1 line 7). Accordingly, applicant's "primary component" material reads on a coagulant. McGrow explains further that a "flocculent" is a high molecular weight material that achieves its effect primarily by attaching to and bridging between adjacent suspended particles (col 1 line 11).

McGrow describes the use of 0.5 to 5 parts (col 10 line 1) cationic coagulant polymers, such as polydiallyldimethyl ammonium chloride (col 5 lines 40-44) in concert with one part (col 10 line 1) flocculent polymers, such as the Percol 757 product (col 5 lines 45-48), a copolymer of acrylamide and a quaternary ammonium compound (as shown by Reimschuessel).<sup>3</sup>



McGrow teaches that addition of a solution formed from a blend of bead-form cationic polyDADMAC coagulant, such as Percol 368 brand (col 5 line 43) or Magnafloc 368 (col 7 line 37), and bead-form 90 mole % cationic acrylamide copolymer (col 5 line 55) (col 6 lines 3 – 6) (col 8 line 34) to a municipal sewage sludge gives numerous advantages over addition of a high molecular weight polymeric flocculent alone (col 6 line 30 – 45). The advantages include smaller, evenly structured and highly filterable flocs having good shear stability, a system resistant to overdosing and underdosing, reduced risk of forming gelatinous flocs, drier cake, reduced cycle times, better dewatering equipment capacity utilization, improved filtrate quality, better cake release, and cleaner filter cloths.

Per claims 1, 2, 15, and 16, it would have been obvious to have conducted Eberhard's Example III at thermophilic range temperatures higher than 50°C, say, at about 55 – 60°C, because temperature is a known result-effective variable, nothing in Eberhard teaches away from operating the digestion process at higher temperatures, the skilled artisan would have expected faster pathogen kill and waste degradation rates in view of the Arrhenius equation, and because Eberhard teaches that the prior art had conducted enzymatic treatment of biomass at temperatures as high as 60°C (Eberhard, col 1 line 54).

Per claims 1, 2, 15, and 16, it would have been obvious to have substituted addition of McGrow's solution prepared from a blend of bead-form cationic polyDADMAC coagulant, such as Percol 368 brand (col 5 line 43), and bead-form 90 mole % acrylamide copolymer (col 5 line 55) (col 6 lines 3 – 6) to Eberhard's thermophilic sludge for the high molecular weight Zetag 92 polyacrylamide flocculent alone, as taught in Eberhard, in order to achieve the numerous advantages of using a coagulant /

flocculent solution over addition of traditional polymeric flocculent alone, as taught by McGrow (col 6 lines 30-45).

### **Applicant/Owner Response**

Applicant/Owner wishes to point out an area of agreement between the Examiner and Applicant/Owner; that is, while Eberhard does teach the dewatering of thermophilic bio-solids, Eberhard does not teach the use of a polyquaternary amine, e.g. polymeric quaternary ammonium compound, as primary component in the dewatering of bio-solids from a thermophilic digestion process.

Applicant/Owner wishes to point out an additional area of agreement between the Examiner and Applicant/Owner; that is, while McGrow does teach the dewatering of bio-solids, McGrow does not teach the dewatering of a biological sludge from a thermophilic digestion process. To be sure of this fact, Applicant/Owner obtained an electronic copy of McGrow from uspto.gov and performed a word search for thermophilic and for temperature; neither term is even within McGrow.

However, the Examiner is not exactly quoting McGrow. McGrow states in col. 2:

25 Accordingly the commercially preferred process  
involved the adoption of a single treatment using a  
conventional high molecular weight cationic flocculant  
polymer, typically intrinsic viscosity 6 to 8 dl/g. This  
greatly reduces the treatment costs and gives results  
that have been considered adequate. However if the  
30 doses are not controlled accurately, and if overdosing  
occurs, there is a tendency to form large gelatinous  
flocs which can release free water very quickly and  
cause blockage of feed holes, this effect being known as  
coring. Coring prevents full utilisation of the press  
35 chambers and so results in reduction in the volume of  
sludge that can be processed and it reduces the dry  
solids content of the resultant cake. Reducing the dose  
can permit better filling of the filter press but filterabil-  
ity is still inferior, leading to increased cycle time and  
40 reduced cake dry solids.

Emphasis added

McGrow states again in col. 6 lines 30 - 45:

“Compared to the traditional methods using the high molecular weight flocculant alone, the method of the invention gives numerous advantages. The flocs are small, evenly structured and highly filterable and have good shear stability, and the system is **relatively resistant** to

overdosing. Thus the risk of the formation of gelatinous flocs with the consequential disadvantages of coring and reduced productivity can be avoided. In particular, higher cake dry solids can be obtained, again because of the better floc structure. The process is also less susceptible to underdosing, which previously would have led to poor filterability and longer cycle times. Thus, overall, the process can give reduced cycle time, drier cake, better utilization of the capacity of the filter or belt press, improved filtrate quality, better cake release from the cloth, and cleaner filter cloths.” **(Emphasis added)**

Therefore, while McGrow DOES NOT teach the dewatering of bio-solids from a thermophilic digestion process, McGrow specifically teaches that the use of a cationic polyacrylamide alone “greatly reduces the treatment costs and gives results that have been considered adequate”. McGrow then goes on to state that the McGrow invention provides “resistan[ce] to overdosing. Thus the risk of the formation of gelatinous flocs and coring (*from overdosing*) and the associated reduced productivity can be avoided. **Therefore, unless there are dewatering challenges of gelatin formation or of coring resulting from overdosing, McGrow teaches away from the instant claims.** Again, as previously presented to the Examiner, McGrow only teaches avoidance to gelatinous formation and coring. It is obvious from this proceeding that neither of these challenges is an issue in the dewatering of bio-solids from a thermophilic digestion process. Quite the contrary, as is taught by Applicant, the dewatering of bio-solids from a thermophilic digestion process relate to the “**need**” to form of a floc that dewateres well as compared to mesophiles. Specifically, Applicant in col. 1 lines 30 -55 states:

“Meanwhile, **traditional polyacrylamide polymers used for dewatering have been shown to perform very poorly in tests for dewatering of sludge that has been digested by any thermophilic digestion process.** The goal of dewatering is to convert the sludge to a cake of such dryness that the dewatered sludge can be hauled as a solid to a final disposal site at minimal cost. To minimize the amount of sludge to be handled and to minimize dewatering and handling costs associated with the wasted sludge, most biological treatment systems waste the sludge to a digester or a digestion system.” **(Emphasis added)**

Further, the instant specification states in col. 2 lines 25 – 36 state:

“Despite the disadvantages of mesophilic bacteria, **mesophilic bacteria are preferable in relation to the dewatering of digested sludge. Mesophilic bacteria naturally secrete a polysaccharide which acts as a tackifier providing a chemical mechanism of floc**

formation. This chemical mechanism is an aid to traditional cationic polyacrylamides to begin the dewatering process. However, thermophilic bacteria do not secrete a tackifying polysaccharide. Furthermore, thermophilic bacteria naturally repel each other. This repelling nature of thermophilic bacteria makes the dewatering of sludge from the thermophilic digestion process expensive and difficult.” **(Emphasis added)**

Applicant/Owner also teaches and demonstrates in col. 4 lines 59 – 65:

“The best performing traditional polyacrylamide technology utilized at the site of this invention was Nalco 9909, manufactured by Nalco Chemical, Inc. Usage of Nalco 9909 results in a dry polymer dosage often near 2,000 ppm and usually near 1,700 ppm treating sludge near 4 percent solids. Even at this dosage, plant throughput was at 20 percent of rated capacity.” **(Emphasis added)**

This horrendous chemical dosage is in very strong contrast to any dosing discussion within McGrow and is in strong contrast to any dosing taught within any of the Examiner’s Citations. Further, this horrendous chemical dosage should have comprised gelatin or coring, as is taught by McGrow, for one of ordinary skill in the art to have rationally applied McGrow.

Therefore, given the teachings of McGrow in combination with the facts of dewatering thermophiles, there is no rational reason for one of ordinary skill in the art to try the instant claims from the teachings of McGrow; as, McGrow teaches a solution to a different problem (purpose), which is specifically related to mesophiles and is in stark contrast to the problem (purpose) associated with thermophiles. Applicant refers the Examiner to MPEP 2141.02, which states:

“[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the ‘subject matter as a whole’ which should always be considered in determining the obviousness of an invention under 35 U.S.C. § 103.” *In re Spinnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). However, “discovery of the cause of a problem ... does not always result in a patentable invention. . . . [A] different situation exists where the solution is obvious from prior art which contains the same solution for a similar problem.” *In re Wiseman*, 596 F.2d 1019, 1022, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original).” **(Emphasis added)**

In addition, McGrow was originally filed on October 4, 1990 and published May 25, 1993. Applicant respectfully presents to the Examiner a timely reference, which is of record in this proceeding, Chitikela, Srinivasarao and Dentel, Steven K.; *Evaluation of Dual Chemical Conditioning and Dewatering of Anaerobically Digested Biosolids*, 10<sup>th</sup> Annual Residuals &

Biosolids Management Conference: 10 years of Progress and a Look Toward the Future, August 18-21, 1996 (Chitikela 1996), which teaches away from the use of a coagulant and a flocculant in combination to dewater biological sludge. Specifically, Chitikela 1996 states on page 11-29:

“The use of ferric chloride or HDTMA (a quaternary salt) as a preconditioner can reduce the polymer requirement, but this is not a cost effective option at current prices for these additives.”

This is while an article by Dentel, Steven K. and Chitikela, Srinivasarao; *Evaluation of Dual Chemical Conditioning and Dewatering of Anaerobically Digested Biosolids The Final Report Sludge Dewaterability Assessment for East Bay Municipal Utility District (EBMUD) California*, June 1995 (Dentel 1995), and previously cited in this proceeding concludes on page 9 that:

“As a rule of thumb, it appears that adding a proportion of one chemical’s optimum dosage reduces the requirement for the other by the same amount... If this rule were invariably true, it would always be most economical to use only one of the conditioning chemicals by itself. However, the CST results also indicated that sole use of ferric chloride or HDTMA (quaternary salt) did not provide adequate dewaterability even at the optimum dose...”

And, on page 11 that:

“The use of ferric chloride or HDTMA (a quaternary salt) as a preconditioner can reduce the polymer requirement, this is not a cost effective option at current prices for these additives.”

Therefore, at late as 1996 it was not known to be economical to “precondition” a biological sludge with a polyquaternary amine, regardless of the teachings of McGrow. If McGrow made it obvious to precondition bio-solids with a polyquaternary ammine, then why did Dentel and Chitikela, working for a well established University, directly teach away from the teachings of McGrow 6 years later?

Further, the Dentel 1995 and Chitikela 1996 articles are timelier to the instant invention than is McGrow. Fall of 1996 is the time frame of the instant application. Therefore, Dentel 1995 and Chitikela 1996 are much closer references to the instant invention and the instant claims than is McGrow. Applicant/Owner refers the Examiner to MPEP 716.02(e):

Applicants may compare the claimed invention with prior art that is more closely related to the invention than the prior art relied upon by the examiner. *In re Holladay*, 584 F.2d 384, 199 USPQ 516 (CCPA 1978); *Ex parte Humber*, 217 USPQ 265 (Bd. App. 1961) (Claims to a 13-chloro substituted compound were rejected as obvious over nonchlorinated analogs of the claimed compound. Evidence showing unexpected results for the claimed compound as

compared with the 9-, 12-, and 14- chloro derivatives of the compound rebutted the *prima facie* case of obviousness because the compounds compared against were closer to the claimed invention than the prior art relied upon.).

The above is while Dentel 1995 further states on page 2 that:

**"The success of any conditioning process will also depend on the specific dewatering process employed.**

Thus, the conditioning process is **a multivariate problem with no simple strategy available for optimization.** At present, the required dosages for chemical conditioners must be determined empirically. With this being the case, **the use of multiple chemical additives becomes less feasible because of the difficulty in identifying a proper dosage combination.**" (Emphasis added)

And, Chitikela 1996 further states that:

"The success of any conditioning process will also depend on the specific dewatering process employed. Thus, the sludge conditioning process is a multivariate problem with no simple strategy available for its optimization. At present, the required dosages for chemical conditioners must be determined empirically. With this being the case, the use of multiple chemical additives become less feasible because of the difficulty in identifying a proper dose combination."

Therefore, the instant invention could not have been obvious at the time of filing for the instant invention; as:

1. Both Dentel 1995 and Chitikela 1996 taught not to practice the instant application and the instant claims (teaching away), and
2. At the time of the instant invention it was "less feasible" to develop the instant invention due to the "difficulty" of a "multivariate problem". This teaching is presented for a traditional mesophilic biological sludge; therefore, the difficulty is enhanced and the feasibility is reduced with the further complication of a thermophilic biological sludge (undue experimentation to develop the instant claims).

The above statements and teachings from June 1995 and August 1996 are while the parent application for the instant application, e.g. 08/721,557, was filed on 09/26/96. Therefore, at the time of the instant invention, "means by which chemical conditioners interact with the colloidal phase

in biological suspensions to facilitate the release of water [was] poorly understood". This is while at the time of the instant invention, Dentel 1995 and Chitikela 1996 demonstrate that "the optimal amounts and types of conditioners required depending on a variety of factors": 1) "aqueous and surface chemistries of the sludge", 2) "physical properties of the suspended solids, which are determined by characteristics of the original wastewater and by the operational parameters for the various treatment processes employed with the plant", and 3) "the chemistry of any chemical conditioner used, and how it interacts with the biosolids".

These factor teachings at the time of the instant invention are while none of the cited references alone or in combination teach a "method for dewatering thermophilic biological sludge" comprising any of these factors. This is while the instant invention teaches the dewatering of a thermophilic biological sludge, e.g. 1) "aqueous and surface chemistries of the sludge" in column 2:

Despite the disadvantages of mesophilic bacteria, meso-  
45 phyllic bacteria are preferable in relation to the dewatering  
of digested sludge. Mesophilic bacteria naturally secrete a  
polysaccharide which acts as a tackifier providing a chemical  
mechanism of floc formation. This chemical mechanism  
is an aid to traditional cationic polyacrylamides to begin the  
50 dewatering process. However, thermophilic bacteria do not  
secrete a tackifying polysaccharide. Furthermore, thermophilic  
bacteria naturally repel each other. This repelling  
nature of thermophilic bacteria makes the dewatering of  
sludge from the thermophilic digestion process expensive  
55 and difficult.

The instant invention also teaches, 2) "physical properties of the suspended solids, which are determined by characteristics of the original wastewater and by the operational parameters for the various treatment processes employed with the plant" in column 2:

At temperatures of at least  
about 115° F., active bacteria are of the thermophilic variety.  
Aerobic and/or anaerobic thermophilic microorganisms are  
30 used to carry out any required degradation in a thermophilic,  
exothermic process. The thermophilic digestion system  
relies on high operating temperatures (greater than about 55°  
C. or 131° F.) to achieve a substantial pathogen destruction.  
While a fraction of the energy released from the thermo-  
35 philic process is stored intracellularly to form new cells, a  
larger fraction of the energy is released as heat into the  
environment. The released heat is the major heat source used  
to achieve the desired operating temperature. Experiments  
have shown that between about 8,500 and 13,000 BTU are  
40 released with the thermophilic digestion of one pound of

volatile solids (bacteria). By maintaining a sufficient temperature for a required period of time, pathogenic organisms are reduced to below detectable levels.

Lastly, the instant invention teaches, 3) "the chemistry of any chemical conditioner used, and how it interacts with the biosolids" in column 5:

The significant improvements of this invention in sludge dewatering are accomplished by the addition of polyquaternary amines to the sludge. Di-allyl di-methyl ammonium chlorides (DADMAC) and epichlorohydrin di-methyl amine (epi-DMA) are two preferred polyquaternary amines used in sludge dewatering. Both of these polyquaternary amine moieties have been found to provide sites for the dewatering of sludge from the thermophilic digestion process.

And, again in column 7:

#### EXAMPLE 1

A bench test was performed utilizing an electrical variable speed beaker stir system, commonly referred to as a jar test. 2000 ppm of CV 3750 (20% active) were added to 500 mnl of sludge from the thermophilic digestion system. The percentage of solids in the sludge was about 4.4 percent. The beaker was allowed to stir at 120 rpm for 30 seconds. At 30 seconds, the rpm was reduced to 90 and 1500 ppm of CV 5120 in a 0.25 percent solution were added to the beaker. After 15 seconds, the stir speed was slowed to 30 rpm and mixed for another 30 seconds. Large, heavy floc (e.g. with a diameter of at least about 4 mm) was formed with a somewhat cloudy supernatant.

And, again in column 9:

#### EXAMPLE 7

A plant test was performed on Sep. 10, 1996 at the municipal wastewater treatment facility for the City of College Station Texas. This facility has a thermophilic digestion system as designed by Kruger, Inc. The average temperature of the digester is usually near 65° C. Dewatering is accomplished on a Sharpels Polymixer 75000 centrifuge. Polymer inversion is accomplished on a Polymixer 500 which is designed for a dry polymer. Normal plant operation requires 1500 to 2000 ppm of Nalco 9909 obtaining variable sludge cake dryness, a final centrate that is usually much over 200 ppm of total suspended solid and a plant throughput of 10 to 15 gpm sludge. The centrifuge was started up on CV 5380 and Nalco 9909 with the CV 5380



having a polymer concentration of 400 ppm and the Nalco 9909 having a concentration of 450 ppm. The centrifuge was run between 45 and 55 gpm of sludge throughput. The produced sludge was over 18 percent cake solids. The centrate was less than 50 TSS. <sup>25</sup>

Therefore, at the time of the instant invention "means by which chemical conditioners interact with the colloidal phase in biological suspensions to facilitate the release of water was poorly understood", while it was known at the time of the instant invention that three teachings were needed to understand said means, all of which are taught by Applicant in the instant specification, specifically:

1. "Aqueous and surface chemistries of the sludge", e.g. polysaccharides;
2. "Physical properties of the suspended solids, which are determined by characteristics of the original wastewater and by the operational parameters for the various treatment processes employed with the plant"; and
3. "The chemistry of any chemical conditioner used, and how it interacts with the biosolids".

Therefore, as previously argued and is furthered herein, Applicant discovered "the source of the problem" and taught a solution to "the source of the problem" in the instant specification. This is while "the source of the problem" to dewater thermophilic biosolids was not taught or suggested by others, as was required in the art.

This is while the previously presented US EPA Document TBS Prakasam, et al. *Effect of Recycling Thermophilic Sludge on the Activated Sludge Process*, EPA Project Summary 5, Sept. 1990 states under the heading of Dewaterability:

"Capillary suction time (CST) measurements at various polymer dosages indicated that mesophilic sludge required a lower polymer dosage than did the thermophilic sludge (10 vs. 22.5 kg/dry tonne) to achieve the minimum CST that was possible. The thermophilic sludge, however, exhibited highest floc strength than did the mesophilic sludge.

Pilot scale centrifuge studies confirmed that the thermophilic sludge required a higher polymer dosage than did the mesophilic sludge. At optimal polymer dosages, those studies also indicated that the mesophilic sludge approached 100% solids capture whereas the thermophilic solids approached a maximum of 96% solids capture. The lower solids capture with thermophilic sludge probably resulted from the higher concentration of fine particles in it than in the mesophilic sludge."

The report goes on to recommend that:

“Based on the lack of effect on sludge mass and the increase in digestion capability required, the Torpsy process is not recommended for Chicago’s conventional rate activated sludge plants. Nor is thermophilic digestion as the terminal sludge digestion process recommended if the sludge is to be used at a site with nearby neighbors.”

Therefore, the teachings of the instant invention were not obvious to the industry in September of 1990, wherein the US EPA, taught away from the instant claims; while again, in 1995 and in 1996 the instant claims were taught away from by a recognized University Authority.

Applicant/Owner refers the Examiner to MPEP 2145 D, which states:

**References Teach Away from the Invention or Render Prior Art Unsatisfactory for Intended Purpose**

In addition to the material below, see MPEP § 2141.02 (prior art must be considered in its entirety, including disclosures that teach away from the claims) and MPEP § 2143.01 (proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference).

**1. The Nature of the Teaching Is Highly Relevant**

A prior art reference that **"teaches away" from the claimed invention is a significant factor** to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994) (Claims were directed to an epoxy resin based printed circuit material. A prior art reference disclosed a polyester-imide resin based printed circuit material, and taught that although epoxy resin based materials have acceptable stability and some degree of flexibility, they are inferior to polyester-imide resin based materials. The court held the claims would have been obvious over the prior art because the reference taught epoxy resin based material was useful for applicant's purpose, applicant did not distinguish the claimed epoxy from the prior art epoxy, and applicant asserted no discovery beyond what was known to the art.).

Furthermore, "the prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit,

or otherwise discourage the solution claimed...." *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). **(Emphasis added)**

Along with MPEP 2141.02 VI, which states:

**PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS**

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984) (Claims were directed to a process of producing a porous article by expanding shaped, unsintered, highly crystalline poly(tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.).

However, "the prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not **criticize, discredit, or otherwise discourage the solution claimed....**" *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). See also MPEP § 2123. **(Emphasis added)**

Applicant/Owner, then further, refers the Examiner to the declarations on file, wherein it is evidenced that there existed at the time of filing for the instant application, at College Station, a difficulty to dewater biological solids from a thermophilic digestion process while the instant claims were not practiced; and wherein, it was only after teachings of Applicant/Owner that instant claim 1 was practiced in College Station, Texas, e.g. Allied Colloids. This fact is furthered in the declarations wherein the Examiner can note that at Texarkana, Texas it was only after teachings of Applicant/Owner that instant claim 33 was practiced in Texarkana, Texas. Therefore, at a time wherein the Examiner's Citations were available, the instant claims were not obvious at two locations without the teachings of Applicant/Owner.

In addition, at the time of the instant invention, those of ordinary skill in the art would have had available the US EPA (1990), Dentel 1995 and Chitikela 1996 references. Therefore, for one of ordinary skill in the art to have developed the instant invention and the instant claims from the Examiner's Citations at the time of the instant invention, one of ordinary skill in the art would have had to: 1) apply McGrow to the dewatering of thermophilic bio-solids when there is no teaching in McGrow in relation to thermophilic bio-solids, 2) ignore the fact that cationic polyacrylamides alone are unsuccessful in the watering of thermophilic bio-solids, as evidenced in the instant invention, and use a cationic polyacrylamide anyway, 3) ignore the teachings in McGrow, which refer to gelatin formation and coring, neither of which is the challenge with the dewatering of thermophilic bio-solids, 4) ignore the teachings of Dentel 1995 and Chitikela 1996 and apply a polyquaternary amine anyway as a pre-conditioner to sludge from a thermophilic digestion process, 5) apply all of the above in light of Eberhard, while Eberhard teaches the use of an enzyme and a chelant, all the while ignoring the use of an enzyme and a chelant as taught in Eberhard, while 6) replacing both the enzyme and the chelant in Eberhard with a polymeric quaternary ammonium compound against the teachings of Dentel 1995 and Chitikela 1996.

Applicant/Owner would like to present to the Examiner that such an irrational path is not a path for one of ordinary skill in the art; or quite frankly, for one of expert skill in the art; there are just too many irrational decisions which must be made with the cited references at the time of the instant specification without having the teaching and/or understanding of the source of the problem as is taught in the instant specification. This is while due to the teachings of McGrow, the only reason to go against Dentel 1995 and Chitikela 1996 would be in the instances of **"coring" or of "gelatin formation", neither of which is remotely an issue with the dewatering of thermophilic bio-solids.** This is while the **instant invention is for a different purpose, e.g. the dewatering of "thermophilic" bio-solids; and, it would have been obvious to one of ordinary skill in the art that the dewatering of thermophilic bio-solids is a "different purpose" than the dewatering of mesophilic bio-solids, as mesophilic bio-solids are traditionally dewatered with a cationic polyacrylamide; while as taught and demonstrated in the instant invention, thermophilic bio-solids are difficult at best to dewater with a cationic polyacrylamide. Therefore, and without question, to one of ordinary skill in the art, the dewatering of mesophilic bio-solids and the dewatering of thermophilic bio-solids are different purposes.** Then, in order to develop the instant invention, one of ordinary skill in the art would have to take the teachings of McGrow for dewatering challenges in relation to mesophiles,

which are not at all an issue with thermophiles, and apply McGrow to thermophiles, again different purposes, while ignoring the teachings in Eberhard as to the use of a chelant and dispersant while replacing the chelant and the dispersant in Eberhard with a polymeric quaternary ammonium compound, which again goes against a very timely references of Dentel 1995 and Chitikela 1996. Wow!

Given the requirements for and rather irrational decision making required for one of ordinary skill in the art at the time of the instant invention to develop the instant invention, Applicant/Owner would like to suggest that the Examiner's cited combination, e.g. Eberhard in view of Williams and McGrow in view of Reimschuessel is "hindsight reconstruction". Applicant/Owner would like to refer the Examiner to MPEP 2144.06 which states:

#### **COMBINING EQUIVALENTS KNOWN FOR THE SAME PURPOSE**

"It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray-dried detergent by mixing together two conventional spray-dried detergents were held to be *prima facie* obvious.). See also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and *Ex parte Quadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (mixture of two known herbicides held *prima facie* obvious). But see *In re Geiger*, 815 F.2d 686, 2 USPQ2d 1276 (Fed. Cir. 1987) ("Based upon the prior art and the fact that each of the three components of the composition used in the claimed method is conventionally employed in the art for treating cooling water systems, the board held that it would have been *prima facie* obvious, within the meaning of 35 U.S.C. 103, to employ these components in combination for their known functions and to optimize the amount of each additive.... Appellant argues... hindsight reconstruction or at best,... 'obvious to try'.... We agree with appellant.").

#### **SUBSTITUTING EQUIVALENTS KNOWN FOR THE SAME PURPOSE**

In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958) (The mere fact that components are claimed as members of a Markush group cannot be relied upon to establish the equivalency of these components. However, an applicant's expressed recognition of an art-recognized or obvious equivalent may be used to refute an argument that such equivalency does not exist.); *In re Scott*, 323 F.2d 1016, 139 USPQ 297 (CCPA 1963) (Claims were drawn to a hollow fiberglass shaft for archery and a process for the production thereof where the shaft differed from the prior art in the use of a paper tube as the core of the shaft as compared with the light wood or hardened foamed resin core of the prior art. The Board found the claimed invention would have been obvious, reasoning that the prior art foam core is the functional and mechanical equivalent of the claimed paper core. The court reversed, holding that components which are functionally or mechanically equivalent are not necessarily obvious in view of one another, and in this case, the use of a light wood or hardened foam resin core does not fairly suggest the use of a paper core.); *Smith v. Hayashi*, 209 USPQ 754 (Bd. of Pat. Inter. 1980) (The mere fact that phthalocyanine and selenium function as equivalent photoconductors in the claimed environment was not sufficient to establish that one would have been obvious over the other. However, there was evidence that both phthalocyanine and selenium were known photoconductors in the art of electrophotography. "This, in our view, presents strong evidence of obviousness in substituting one for the other in an electrophotographic environment as a photoconductor." 209 USPQ at 759.).

An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)."

Applicant/Owner refers the Examiner to MPEP 2141.01 III:

**CONTENT OF THE PRIOR ART IS DETERMINED AT THE TIME THE INVENTION WAS MADE TO AVOID HINDSIGHT**

The requirement "at the time the invention was made" is to avoid impermissible hindsight. See MPEP § 2145, paragraph X.A. for a discussion of rebutting applicants' arguments that a rejection is based on hindsight.

"It is difficult but necessary that the decisionmaker forget what he or she has been taught . . . about the claimed invention and cast the mind back to the time the invention was made (often as here many years), to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Applicant/Owner also refers the Examiner to MPEP 2145 X:

## **ARGUING IMPROPER RATIONALES FOR COMBINING REFERENCES**

### **A. Impermissible Hindsight**

Applicants may argue that the examiner's conclusion of obviousness is based on improper hindsight reasoning. However, "[a]ny judgement on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper." *In re McLaughlin* 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971). Applicants may also argue that the combination of two or more references is "hindsight" because "express" motivation to combine the references is lacking. However, there is no requirement that an "express, written motivation to combine must appear in prior art references before a finding of obviousness." See *Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1276, 69 USPQ2d 1686, 1690 (Fed. Cir. 2004). For example, motivation to combine prior art references may exist in the nature of the problem to be solved (*Ruiz* at 1276, 69 USPQ2d at 1690) or the knowledge of one of ordinary skill in the art (*National Steel Car v. Canadian Pacific Railway Ltd.*, 357 F.3d 1319, 1338, 69 USPQ2d 1641, 1656 (Fed. Cir. 2004)). See **MPEP § 2143.01** for a discussion of proper motivation to combine references.

As Applicant/Owner has respectfully traversed the Examiner's Rejection with multiple arguments. Applicant/Owner respectfully requests and allowance of claims 1, 2, 15, and 16 as amended herein.

### **The Examiner –**

Per claim 4, the prior art literature in this field suggests that coagulant and flocculant polymers should be dosed sequentially, as shown by McGrow (col 6 line 62).

Accordingly, it would have been obvious to have first added McGrow's coagulant to

Eberhard's thermophilic digestion process-treated biosludge, allowed for microfloc development, and then added McGrow's polymeric flocculant, as suggested by the prior art literature. The McGrow disclosure as a whole does not constitute a "teaching away" of the invention of claim 4 at least for the reason that the prior art literature expressly suggests sequential addition of coagulant and flocculant, or because the skilled artisan is not compelled to avail himself or herself of certain advantages when an alternative albeit less advantageous approach is suggested. Alternatively, it would have been obvious at the time the Haase '435 invention at issue was made to have adopted the prior art sequential addition approach in order to avoid infringement of the McGrow patent. Independent claims 1 and 6 of McGrow, for example, each require a step of providing a water-soluble particulate mixture of beads of cationic coagulant polymer and separate beads of cationic flocculant polymer.

#### **Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claim 4 as amended herein.

#### **The Examiner –**

Per claims 5 - 6, 27 McGrow describes coagulant: flocculant ratios of 0.5 – 5 (col 10 line 1), i.e., 0.5:1 to 5:1.

#### **Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claims 5 - 6, and 27 as amended herein.



**The Examiner –**

Per claims 7, 28, the dosage of polymer added per percent total solids in the sludge is a matter of routine experimentation, so optimization of the same would have been *prima facie* obvious. Besides, McGrow's example of "about 4 kg per ton dry solids sludge" (col 7 line 50) corresponds to about 44 ppm:1% solids.<sup>4</sup> Claim-recited "about 50 ppm : 1% " reads on about 44 ppm:1% solids, as described by McGrow. Furthermore, the range of about 44 ppm:1% solids to about 55 ppm:1% solids is suggested by McGrow's comparison test using 4 – 5 kg polymer (col 7 line 59) so that true side-by-side comparisons can be made.

**Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claims 7 and 28 as amended herein.

**The Examiner –**

Per claim 8, McGrow states that coagulant beads can be added directly to the suspension followed by addition of an anionic flocculent. MrGrow col 4 lines 4 – 13. Additional details about this disclosure are provided by US patent application Ser. No. 546, 435 filed 6/29/90 (now USP 5178774 to Payne et al.). See Payne col. 4 lines 14-24 and Example I, at col 11. Given the disclosure that coagulant polymers are "highly charged," the claim-recited limitation of "cationic overcharge" is inherently described in the disclosure of addition of polyDADMAC or other highly charged coagulant polymer to a suspension.

**Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claim 8 as amended herein.

**The Examiner –**

Per claims 10 and 12, McGrow describes using 10 parts coagulant polymer for each part flocculant polymer (col 5 lines 56-63, especially line 61). Alternatively, per claims 12 and 13, it would have been obvious to have optimized the relative proportion of the coagulant and flocculant because this process parameter is well-known to be result-effective in flocculation processing.

**Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claims 10 and 12 as amended herein.

**The Examiner –**

Per claim 11, see col 9 lines 7 – 41, particularly lines 10 – 11, as well as col 6 line 55 of Payne (incorporated by reference into McGrow). Payne teaches using anionic flocculants that are at least 50% anionic. Applicant / owner's claim-recited limitation that the anionic polyacrylamide be "about 40% anionic" reads on Payne's description of the anionic polyacrylamide flocculant that is 50% anionic. Alternatively, it would have been obvious to have varied the mol % of the charged (anionic) monomer in the flocculant

copolymer to optimize dewatering performance because percent charge is a known result-effective variable, as shown by McGrow and Payne.

#### **Applicant/Owner Response**

Applicant/Owner would like to respectfully quote MPEP Section 2143.03 which states, "If an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending there from is non-obvious *In re Fine*, 837 F2d.1071, 5 USPQ 2d 1596, Fed. Cir. 1988." As Applicant has respectfully traversed the Examiner's Rejection of claim 1, from which claim 4 depends, Applicant/Owner respectfully requests an allowance of claim 11 as amended herein.

#### **The Examiner –**

Claims 1 - 2, 4 - 8, 10-13, 15-16, 22, 24-28, 33, 35-38, 40, 41, 44-48, 51-55, 58, 67-70, 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admissions as to the state of the prior art further in view of McGrow.

Applicant admits<sup>5</sup> that it was known that a thermophilic digestion process in public use in this country at College Station Texas added a commercial "cationic" polyacrylamide flocculent to facilitate dewatering of the biological sludge. It was known also that the dewaterability of this sludge was less than desired. There was an apparent motivation to improve the dewaterability of the sludge.

#### **Applicant/Owner Response**

Applicant/Owner presents to the Examiner that the Examiner's statement supports Applicant/Owner's argument that there was motivation to improve the dewatering of biosolids from a thermophilic digestion process at the time of the instant application. This is while, it is also apparent from both declarations, Richard A. Haase and Audrey L. Haase, that "others" in the industry were obviously incapable of solving the less than desired dewaterability of biosolids from a thermophilic digestion process, only practicing the instant claims at College Station and/or at Texarkana after the teaching of Applicant/Owner, as referenced in said declarations. Due to this time line, it is apparent that the instant claims were not obvious with the available Examiner Citations at the time of the instant application.

**The Examiner –**

McGrow teaches that addition of a solution formed from a blend of bead-form cationic polyDADMAC coagulant, such as Percol 368 brand (col 5 line 43) or Magnafloc 368 (col 7 line 37), and bead-form 90 mole % cationic acrylamide copolymer (col 5 line 55) (col 6 lines 3 – 6) (col 8 line 34) to a municipal sewage sludge gives numerous advantages over addition of a high molecular weight polymeric flocculent alone (col 6 line 30 – 45). The advantages include smaller, evenly structured and highly filterable flocs having good shear stability, a system resistant to overdosing and underdosing, reduced risk of forming gelatinous flocs, drier cake, reduced cycle times, better dewatering equipment capacity utilization, improved filtrate quality, better cake release, and cleaner filter cloths.

In light of McGrow's teaching that use of a combination of polyDADMAC and cationic polyacrylamide performs better with respect to filterability of formed flocs, better shear stability, drier cake, i.e., improved dewaterability, better dewatering equipment capacity utilization, and various other dewatering process parameters, compared to use of a cationic polyacrylamide flocculent alone, it would have been obvious to have added an effective amount of polyDADMAC to the biological solids at the College Station plant.

**Applicant/Owner Response**

In order not to be repetitive, Applicant/Owner refers the Examiner to previous argument regarding the teachings of McGrow, along with all previous 103(a) argument relating to McGrow; therefore and incorporating previous, Applicant/Owner respectfully presents that the citation of McGrow to develop the instant invention, even though a cationic polyacrylamide was in use at College Station at the time of the instant application, is hindsight reconstruction. Further, McGrow teaches away from the instant claims. Further still, Applicant/Owner wishes to present to the Examiner that at the time of the instant application there were much more timely references, as previously presented, which also taught away from the instant claims. Finally, at College Station, it was only weeks after

the teaching of Applicant/Owner to Allied Colloids of instant independent claim 1 that independent claim 1 was practiced by Allied Colloids, the owner of McGrow, at College Station.

As Applicant/Owner has respectfully traversed the Examiner's Rejection with multiple arguments, Applicant/Owner respectfully requests an allowance of claims 1 – 2, 4 – 8, 10 – 13, 15 – 16, 22, 24 – 28, 33, 35 – 38, 40, 41, 44 – 48, 51 – 55, 58, 67 – 70, and 73 as amended herein.

#### **The Examiner –**

If Applicant were indeed aware that the industry and Allied Colloid were attempting to improve dewatering of a thermophilic biological sludge by adding this particular compound and this particular polyacrylamide, then surely the Examiner would want to know whether Applicant acquired this specific knowledge before or after applicant's conception of the claimed invention.

#### **Applicant/Owner Response**

While it is correctly stated by the Examiner that there was a "motivation" to develop the instant claims at the time of filing for the instant application, Applicant/Owner is "not aware of any previous teaching" or "practice" for the instant claims at the time of the instant application.

Further, as McGrow does not teach all of the instant claim limitations, e.g. the dewatering of biosolids from a thermophilic digestion process, Applicant/Owner would like to cite MPEP 2143.02, which states:

"To establish *prima facie* obviousness of a claimed invention, **all the claim limitations must be taught or suggested by the prior art.** *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

"**All words in a claim must be considered in judging the patentability of that claim against the prior art.**" *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending there from is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)." **(Emphasis added)**

In direct support of the facts of copying by others, e.g. use of the instant claims only after a teaching by Applicant/Owner, as evidenced in the declaration submitted, Applicant/Owner would like to cite MPEP 716.06, which states:

“Evidence of copying was persuasive of nonobviousness when an alleged infringer tried for a substantial length of time to design a product or process similar to the claimed invention, but failed and then copied the claimed invention instead. *Dow Chem. Co. v. American Cyanamid Co.*, 837 F.2d 469, 2 USPQ2d 1350 (Fed. Cir. 1987).” **(Emphasis added)**

### **Applicant/Owner Argument Summary**

1. The scope and content of the prior art comprise:
  - Eberhard – Dewatering of a biological sludge from a thermophilic digestion process, wherein dewatering comprises: 1) a chelant, 2) an enzyme, and 3) a cationic polyacrylamide.
  - McGrow – Dewatering of a biological sludge from a mesophilic digestion process, wherein there is a challenge of overdosing, which leads to gelatinous floc formation and/or coring, and which is often overcompensated for by underdosing. McGrow’s solution to overdosing is the combination of a coagulant and a cationic polyacrylamide. One of the coagulant’s disclosed is poly(DADMAC). Absent gelatin formation and/or coring, McGrow teaches away from the instant claims.
2. The scope and content of the instant independent claims comprise the dewatering of biological sludge from a thermophilic digestion process by either:
  - a. Contacting the biological sludge with a polymeric quaternary ammonium compound and a cationic or an anionic polyacrylamide, or
  - b. Contacting the biological sludge with a polymeric quaternary ammonium compound, while
  - c. The instant specification teaches the source of the problem, and
  - d. The source of the problem has not been shown to comprise gelatin formation or coring.
3. The differences between the prior art and the instant independent claims comprise:
  - a. Eberhard does not teach in the dewatering of a biological sludge from a thermophilic digestion process the need of a polymeric quaternary ammonium compound, while teaching the need of an enzyme and a chelant.
  - b. McGrow:
    - Does not teach dewatering of biological sludge from a thermophilic digestion process,
    - Does not teach the need of a polymeric quaternary ammonium compound as the primary component in dewatering biological sludge from a thermophilic digestion process, while
    - Teaching a method to improve upon overdosing challenges, e.g. gelatin formation and coring, in the dewatering of mesophilic biological sludge, and
    - Teaching away from the instant claims absent gelatin formation or coring.
  - c. The above is while:

- Neither Eberhard nor McGrow teach the source of the problem at a time when industry literature from notable sources taught a need to understand the source of the problem,
  - Notable sources taught away from the teachings of McGrow,
  - Notable sources taught away from the instant claims, and
  - Due to the above, for one of ordinary skill in the art to obtain the instant claims at the time of the filing of the instant application, an irrational decision process would have to be employed.
4. The level of skill for one of ordinary skill in the art would be similar to or as that of Audrey Haase as stated in her declaration, e.g. a high level technician for a polymer supplier or an operator at a wastewater treatment plant.
  5. It was difficult at the time of the instant invention for one of ordinary skill in the art to have developed the instant claims without an understanding of the source of the problem; the need for this understanding is taught by notable authorities in the art, which otherwise state the "difficulty" of a "multivariate problem".
  6. Due to all of the above, the Examiner's Prime Facie Case against the independent claims comprises hindsight reconstruction.

#### **Recent US Supreme Court Case Law**

KSR International v. Teleflex, Inc. et al., No. 04-1350, 550 U.S. \_\_ (2007). Excerpts from this case which support non-obviousness of the instant invention are:

1. In relation to Hindsight Reconstruction:

4. The Federal Circuit's perspective on the problem of hindsight is itself problematic. This Court cautioned in *Graham* against "read[ing] into the prior art the teachings of the invention in issue." 383 U.S. at 36. The Court did not perceive, however, any need for extraordinary showings of obviousness to avoid that danger. The Federal Circuit's rigid test underestimates the capacity of courts and the PTO to avoid the influence of hindsight. Retrospective analysis is not unique to patent law, but regularly arises in a wide variety of contexts, including the determination of the competency of counsel in criminal proceedings, see, e.g., *Rompilla v. Beard*, 125 S. Ct. 2456, 2462 (2005), reasonable use of force by police officers, see, e.g., *Graham v. Connor*, 490 U.S. 386, 396 (1989),

and probable cause, see, e.g., *Maryland v. Garrison*, 480 U.S. 79, 85 (1987). In those situations, as in *Graham*, the Court has consistently recognized that decisionmakers can avoid the improper influence of hindsight by maintaining conscious awareness of its potentially distorting influence in the decisionmaking process.<sup>10</sup> Courts routinely find, for example, an absence of probable cause in cases in which the police in fact find substantial quantities of contraband in a search. There is no reason to think that courts in patent cases cannot be similarly discerning.

2. In relation to innovation beyond the level beyond ordinary skill in the art wherein prior teachings "would have deterred any investigation into the inventor's combination":

Finally, in the only post-*Graham* decision in which the Court has specifically ruled that a claimed invention is nonobvious, *United States v. Adams*, 383 U.S. 39 (1966), the Court did so without suggesting that the mere absence of any teaching, suggestion, or motivation from the prior art would be sufficient to overcome obviousness objections. See *id.* at 51-52. The Court ruled that the invention at issue—a water-activated, constant-voltage battery—was nonobvious, even though it combined elements that were "well known in the prior art" (*id.* at 51), because it demonstrated innovation beyond the level of ordinary skill in the art. The Court explained that the battery performed in a way that was "unexpected" and "far surpassed then-existing wet batteries" (*ibid.*); the teachings of the prior art would have "deter[red] any investigation" into the inventor's combination (*id.* at 52); and "noted experts expressed disbelief in it" (*ibid.*).

3. In relation to commercial success and prior failure of others.

35 U.S.C. 103(a). "The nonobviousness requirement extends the field of unpatentable material beyond that which is known to the public under § 102, to include that which could readily be deduced from publicly available material by a person of ordinary skill in the pertinent field of endeavor." *Bonito Boats*, 489 U.S. at 150 (citing *Graham*, 383 U.S. at 15).

The question of nonobviousness is ultimately one of law, but it turns on "several basic factual inquiries." *Graham*, 383 U.S. at 17. This Court has identified several such inquiries:



(1) “the scope and content of the prior art”; (2) “differences between the prior art and the claims at issue”; and (3) “the level of ordinary skill in the pertinent art.” *Ibid.* In addition, the Court has stated that “secondary considerations,” such as “commercial success” or “long felt but unsolved needs,” might provide “indicia of obviousness or nonobviousness.” *Id.* at 17-18.

The “ultimate question” of patent validity under Section 103(a) is a question of law. *Graham*, 383 U.S. at 17. It rests on a legal judgment, informed by relevant facts, of whether the hypothetical person having ordinary skill in the art would have found the invention as a whole “obvious.” Section 103(a) itself identifies three “central factors relevant to any inquiry into obviousness” (*Johnston*, 425 U.S. at 226): the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the pertinent art. See *Graham*, 383 U.S. at 17. Other “secondary considerations” —including a long-felt and unfulfilled need for the invention, the prior failures of others, and the commercial success of the invention—may also provide “indicia” supporting the legal conclusion of “obviousness or nonobviousness,” *id.* at 17-18, 35-36, but those considerations will not render an obvious invention patentable. *Anderson’s-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 61 (1969) (citing *Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp.*, 340 U.S. 147, 153 (1950)).

### **Conclusion**

Applicant respectfully requests entry of this RCE, Office Action Response and amendment, along with favorable reconsideration of the pending claims. Applicant has respectfully provided to the Examiner numerous facts and argument which support allowance of the claims. Specifically, Applicant has respectfully provided to the Examiner relevant facts and argument relating to:

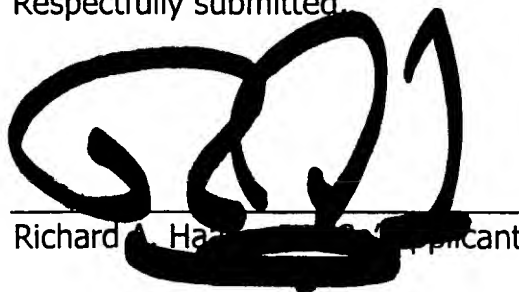
1. Teaching away by notable published references at the time of the instant invention,
2. Discovery of the source of the problem by Applicant, as evidenced in the instant application and as required by notable published references at the time of the instant application,
3. Hindsight reconstruction, as evidenced in the Examiner's Citations both at face value and when taken in context to notable publications at the time of the instant application,
4. Copying by others, after Applicant/Owner teachings, as evidenced in secondary considerations, and
5. Commercial success by others, after Applicant/Owner teachings, as evidenced in secondary considerations, while

relevant U.S. Supreme Court Case Law.

This amendment places the claims in a condition for allowance. Applicant requests that in view of this fact, this request for continued examination, office action response and amendment be entered, and after due consideration of the facts presented herein, the claims be allowed and a certificate be issued.

To facilitate the resolution of any issues or questions presented by this paper, Applicant respectfully requests that the Examiner directly contact the undersigned by phone to further the discussion, reconsideration and allowance of the claims.

Respectfully submitted,



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